MYCOTAXON

ISSN (print) 0093-4666 (online) 2154-8889 Mycotaxon, Ltd. ©2020

April–June 2020—Volume 135, pp. 365–370

https://doi.org/10.5248/135.365

Badhamia versicolor and *Trichia subfusca*, new records for Belarus

Evgeny Moroz [1] & Andrei Tsurykau [2,3*]

[1] *Laboratory of Mycology, V.F. Kuprevich Institute of Experimental Botany of the National Academy of Sciences of Belarus, Akademicheskaja str. 27, Minsk 220072 Belarus*

[2] *Department of Biology, Francisk Skorina Gomel State University, Sovetskaja str. 104, Gomel 246019 Belarus*

[3] *Department of Ecology, Botany and Nature Protection, Institute of Natural Sciences, Samara National Research University, Moskovskoye shosse 34, Samara 443086 Russia*

* Correspondence to: tsurykau@gmail.com

Abstract—Two myxomycetes, *Badhamia versicolor* and *Trichia subfusca*, are reported for the first time for Belarus. Descriptions and illustrations of both species are provided.

Key words—biodiversity, *Mycetozoa*, myxobiota, *Protozoa*, slime moulds

Introduction

Published accounts of the myxomycetes of Belarus date from the end of the 19th century (Błoński 1888, 1889, 1890; Twardowska 1885). During the ensuing years, the studies of slime moulds were accidental. Important research during the 20th century by Moroz & Novozhilov (1988, 1994) and Moroz (1996) reported 139 species including literature citations and new records. Since then and until very recently (Moroz & Novozhilov 2018; Tsurykau 2017), myxomycetes have been neglected in Belarus.

Recent revision of herbarium material revealed two globally rare myxomycete species new to Belarus, *Badhamia versicolor* and *Trichia subfusca*. The present contribution details their phenotypic characters, distribution, and ecological preferences.

Material & methods

The material was examined using Nikon SMZ745 and Olympus SZ61 dissecting microscopes and an Olympus BX51 compound microscope. Tissues were examined and measured in water. Voucher specimens are deposited in the herbarium of V.L. Komarov Botanical Institute of RAS, Saint Petersburg, Russia (LE) and the Scientific Herbarium of Belarusian Polesie of Francisk Skorina Gomel State University, Gomel, Belarus (GSU). Duplicate specimens are stored in the Herbarium of the Institute of Experimental Botany of the National Academy of Sciences of Belarus, Minsk, Belarus (MSK). Nomenclature follows Lado (2019).

Taxonomy

Badhamia versicolor Lister, J. Bot. 39: 81. 1901. Fig. 1

Mainly clustered, grey to dingy white, rugulose, sessile sporocarps with a narrowed base, 0.3–0.5 mm diam. Capillitium white. Spores ovoid, dull purple, minutely warted, 10–14 × 9–11 μm, arranged in spherical or elliptic clusters (frequently hollow) with 10–40 spores in each cluster. Plasmodium colourless.

Specimen examined – **BELARUS. Minsk region**, **Miadzel district**, close to Konstantinovo village, 54°56′35″N 26°26′48″E, black alder forest, on wood of *Alnus glutinosa* (L.) Gaertn. (*Betulaceae*): 20.VIII.1995, E. Moroz (LE 320679, MSK-F 42108).

Ecology & distribution. *Badhamia versicolor* is a facultatively corticolous species usually found in forest communities in temperate zone, although it can also thrive in arid areas (Abdel-Azeem & Salem Fatma 2013, Estrada-Torres & al. 2009, Wellman 2015). The bark of living trees, mosses, and lichens are the typical substrates (Pliszko & Bochynek 2017).

The species is known from all continents except Antarctica (Abdel-Azeem & Salem Fatma 2013, Macbride 1922, Moreno & al. 2013, Pliszko & Bochynek 2017, Ranade & al. 2012; Wellman 2015). In Europe *B. versicolor* has been reported from France, Germany, Great Britain, Italy, Poland, Russia (Leningrad region and the Republic of Karelia), Spain, Switzerland, Turkey, and Ukraine (Krzemieniewska 1960; Lado 1994; Martin & Alexopoulos 1969; Novozhilov 1993, 2005).

Despite its cosmopolitan range, *B. versicolor* is uncommon and often considered a rare species (Ing, 1999, Martin & Alexopoulos 1969). In Poland, *B. versicolor* is known as one of the rarest slime mould species, reported from only two localities (Pliszko & Bochynek 2017). Currently it is included in Polish national red list of myxomycetes (Drozdowicz & al. 2006).

In Belarus, the species was found within Narochansky National Park at the border of Blue Lakes landscape wildlife sanctuary, one of the most

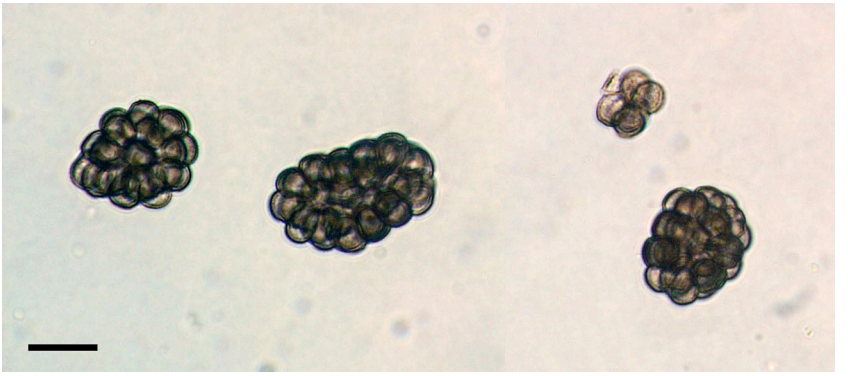

Fig. 1. *Badhamia versicolor* (LE 320679): spore clusters. Scale bar = 20 μm.

undisturbed areas in the country. The forest area is dominated by *Alnus glutinosa* (black alder) with a high degree of waterlogging.

Discussion. The most similar species are *B. capsulifera* (Bull.) Berk. and *B. dubia* Nann.-Bremek., which differ from *Badhamia versicolor* by smaller spore clusters and larger sporocarps (Pliszko & Bochynek 2017, Poulain & al. 2011). Our Belarusian voucher has a white capillitium and therefore resembles *B. papaveracea* Berk. & Ravenel, which differs by having stalked sporocarps (Poulain & al. 2011).

Trichia subfusca Rex, Proc. Acad. Nat. Sci. Philadelphia 42: 192. 1890. Fig. 2

Sporocarps are scattered stalked sporangia, total height 0.8–1.5 mm. Sporotheca subglobose, brown, 0.4–0.8 mm diam. Stipe dark brown, reaching about half the sporocarp height. Peridium double, with an inner membranous and an outer cartilaginous layer. Dehiscence occurring at the top of the sporotheca. Capillitium formed by yellow elaters of 4.5–5.5 μm diam. with 3–4 smooth spirals and with free, short, acute, rarely curved ends. Spores yellow in mass, pale yellow by transmitted light, 11–15 μm diam., regularly warted. Plasmodium not seen.

Specimen examined – **BELARUS. Gomel region**, **Buda-Koshelevo district**, close to Rudnja-Olhovka village, 52°32′N 30°22′E, Scots pine forest, on thallus of lichen *Cladonia uncialis*, 7.VII.2005, A. Tsurykau (GSU 00266, MSK-F 42461).

Ecology and distribution. Like other *Trichia* species, *T. subfusca* inhabits decaying wood (Schirmer & al. 2015).

Trichia subfusca is a very rare species (e.g., Schirmer & al. 2015), occasionally reported from Europe (Austria, Italy, Poland, Russia [Moscow

Fig. 2. *Trichia subfusca* (GSU 00266): capillitium and spores. Scale bar = 10 μm.

and Murmansk regions, Perm Territory, Republic of Karelia, and Komi Republic], Spain, Sweden), Asia (India, Japan, Kazakhstan, Russia, Sri-Lanka), and North America (Canada, USA) (Fefelov 2005; Gmoshinskiy 2014; Lado 1994; Novozhilov 1993, 2005; Schirmer & al. 2015; Vasyagina & al. 1977).

In Belarus the species was found in well-lit dry *Pinus sylvestris* L. (Scots pine) forest at the border of a sand quarry. The sporocarps were found on the terricolous lichen *Cladonia uncialis* (L.) F.H. Wigg. infected with lichenicolous fungus *Taeniolella beschiana* Diederich.

Discussion. The *Trichia botrytis* group includes five morphologically related species: *T. botrytis* (J.F. Gmel.) Pers., *T. erecta* Rex, *T. flavicoma* (Lister) Ing, *T. munda* (Lister) Meyl., and *T. subfusca* (Schirmer & al. 2015). The species most similar to *T. subfusca* is *T. botrytis,* which differs in larger (2–3 mm.), areolate sporocarps with paler lines of dehiscence, elaters that gradually taper to long slender points, and smaller (9–11 mm.) spores. Also similar to *T. subfusca* is *T. macrospora* B. Zhang & Yu Li, distinguished by thicker (5–6 μm diam.) elaters and larger (17–19 μm diam.) densely verrucose spores (Zhang & Li 2016).

Acknowledgments

We thank our reviewers, Kerry Knudsen (Czech University of Life Sciences Prague, Prague, Czechia) and Gražina Adamonytė (Research Council of Lithuania, Vilnius, Lithuania), Mycotaxon Nomenclature Editor Shaun B. Pennycook for helpful comments and improvements, and Yuri K. Novozhilov (Komarov Botanical Institute of RAS, Saint Petersburg, Russia) for confirming the identification of *Trichia subfusca*. The work of Evgeny Moroz was financially supported by the grant 14.W03.31.0015 from the A.O. Kovalevsky Institute of Marine Biological Research of RAS.

Literature cited

Abdel-Azeem AM, Salem Fatma M. 2013. A checklist of Egyptian fungi: I. Protozoan fungal analogues. Mycosphere 4: 794–807. https://doi.org/10.5943/mycosphere/4/4/15

Błoński F. 1888. Spis roślin skrytokwiatowych zebranych w r. 1887 w Puszczy Białowieskiéj. Pamiętnik Fizyjograficzny 8: 75–119.

Błoński F. 1889. Spis roślin zarodnikowych zebranych lub zanotowanych w lecie w r. 1888 w puszczach: Białowieskiéj, Świsłockiéj i Ladzkiéj. Pamiętnik Fizyjograficzny 9: 63–101.

Błoński F. 1890. Wyniki poszukiwań florystycznych skrytokwiatowych dokonanych w ciągu lata 1889 w obrębie pięciu powiatów Królestwa Polskiego. Pamiętnik Fizyjograficzny 10: 129–190.

Drozdowicz A, Ronikier A, Stojanowska W. 2006. Red list of rare Myxomycetes in Poland. 91–99, in: Z Mirek & al. (eds.). Red list of plants and fungi in Poland. Kraków, W. Szafer Institute of Botany, Polish Academy of Sciences.

Estrada-Torres A, Wrigley de Basanta D, Conde E, Lado C. 2009. Myxomycetes associated with dryland ecosystems of the Tehuacán-Cuicatlán Valley Biosphere Reserve, Mexico. Fungal Diversity 36: 17–56.

Fefelov KA. 2005. Myxomycetes (class *Myxomycetes*) of Urals: taxonomical composition, ecology, geography // PhD dissertation, Institute of plant and animal ecology UB RAS, Saint Petersburg. 219 p. (in Russian).

Gmoshinskiy VI. 2014. An annotated checklist of the myxomycetes of the Poriya Guba Bay (White Sea): primary report. The Chronicle of Nature of the Kandalaksha Reserve 59(1): 9–31 (in Russian).

Ing B. 1999. The Myxomycetes of Britain and Ireland. London, The Richmond Publishing. 374 p.

Krzemieniewska H. 1960. Śluzowce Polski na tle śluzowców europejskich. Warszawa, PWN. 313 p.

Lado C. 1994. A checklist of myxomycetes of the Mediterranean countries. Mycotaxon 70: 117–185.

Lado C. 2019. An online nomenclatural information system of *Eumycetozoa*. Madrid, Real Jardín Botánico, CSIC. http://www.nomen.eumycetozoa.com (viewed online on 27 June 2019).

Macbride TH. 1922. The North American slime-moulds, a descriptive list of all species of *Myxomycetes* hitherto reported from the continent of North America with notes on some extra-limited species. New York, London, The Macmillan Company. 382 p. https://doi.org/10.5962/bhl.title.33432

Martin GW, Alexopoulos CJ. 1969. The myxomycetes. Iowa City, Iowa University Press. 477 p.

Moreno G, Castillo A, Deschamps JR. 2013. Critical revision of myxomycetes in the Buenos Aires BAFC herbarium – 1. Mycotaxon 123: 63–79. https://doi.org/10.5248/123.63

Moroz EL. 1996. Myxomycetes of Belarusian Lakeland. 145–146, in: AM Dorofeev (ed.). Biological conservation at the Belarusian Lakeland. Vitebsk, Vitebsk State University Publishing.

Moroz EL, Novozhilov YK. 1988. Review of *Myxomycetes* of Belarus. Novosti Sistematiki Nizshikh Rastenii 25: 92–97 (in Russian).

Moroz EL, Novozhilov YK. 1994. New and rare *Myxomycetes* species from Belarus. Mikologiya I Fitopatologiya 28(3): 21–27 (in Russian).

Moroz EL, Novozhilov YK. 2018. Myxomycetes of Narochansky National Park. Botany: Research 47: 123–135 (in Russian).

Novozhilov YK. 1993. A handbook of fungi of Russia: *Myxomycota*. Vol. 1. Saint Petersburg, Nauka. 288 p. (in Russian).

Novozhilov YK. 2005. Slime moulds (class *Myxomycetes*) of Russia: taxonomical composition, ecology and geography. DSc dissertation, V.L. Komarov Botanical Institute of RAS, Saint Petersburg. 377 p. (in Russian).

Pliszko A, Bochynek A. 2017. A new record of *Badhamia versicolor* Lister (*Physaraceae*) in Poland. Biodiversity: Research and Conservation 45: 23–25. https://doi.org/10.1515/biorc-2017-0003

Poulain M, Meyer M, Bozonnet J. 2011. Les Myxomycètes 1. Guide de détermination. Sévrier, Fédération mycologique et botanique Dauphiné-Savoie. 568 p.

Ranade VD, Korade ST, Jagtap AV, Ranadive KR. 2012. Checklist of *Myxomycetes* from India. Mycosphere 3: 358–390. https://doi.org/10.5943/mycosphere/3/3/9

Schirmer P, Krieglsteiner L, Flatau L. 2015. Revision der Arten der *Trichia botrytis*-Gruppe mit besonderer Berücksichtigung von *Trichia subfusca* Rex. Zeitschrift für Mykologie 81/2: 431–450.

Tsurykau A. 2017. *Licea parasitica* (*Myxomycetes*) new to Belarus. Botanica Lithuanica 23(1): 63–64. https://doi.org/10.1515/botlit-2017-0009

Twardowska M. 1885. Wiadomość o śluzowcach znalezionych w latach 1878–1883. Pamiętnik Fizyjograficzny 5: 160–163.

Vasyagina MP, Byzova ZM, Golovenko IN. 1977. Flora of cryptogams of Kazakhstan. Vol. 10. Lower fungi and myxomycetes (*Phycomycetes* et *Myxomycetes*). Alma-Ata, Nauka KazSSR. 348 p. (in Russian).

Wellman P. 2015. Myxomycetes (slime moulds) of arid to semi-arid areas of northwest New South Wales, Australia. Cunninghamia 15: 153–162.

Zhang B, Li Y. 2016. Identification of a new species, *Trichia macrospora,* and a newly recorded species, *T. flavicoma* (*Myxogastria*), in China. Phytotaxa 258: 179–184. https://doi.org/10.11646/phytotaxa.258.2.7